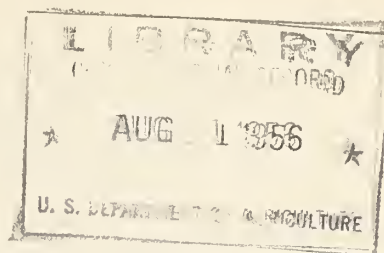


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HARVESTING

Hay and

Straw

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UNITED STATES DEPARTMENT OF AGRICULTURE

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HARVESTING HAY AND STRAW

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Harvesting the hay crop is one of the biggest farm jobs. It involves handling the production of fully one-fifth of all harvested crop acreage in the country. Saving straw for use on the farm and for industrial purposes adds considerably to this huge farm task.

This report presents information on the methods used in harvesting hay and straw over a period of 16 years when important changes in harvesting were taking place. Farmers, the implement industry, and others contributed to the development and introduction of the machines that produced these changes.

The latest data included relate to 1954, a year in which the hay crop of 105 million tons was about average. The information was supplied on a special schedule by the voluntary crop reporters of the United States Department of Agriculture about February 1, 1955. Usable schedules were received from around 28,000 respondents who reported on harvesting methods for 1,300,000 tons of hay and 212,000 tons of straw.

State data from this survey were tabulated in seven size of farm groups, making possible the weighting of sample results by the number of farms in these groups as enumerated in the Census of Agriculture. This procedure was followed to arrive at more representative averages than could otherwise be obtained, as crop reporters' farms often are above average size. Some adjustments were made to calculated averages when samples appeared to be inadequate.

Data for earlier years are mainly from surveys that were generally similar to that for 1954, although they may have differed in detail because of changes in practices. The number of balers on farms on April 1, 1950, and November 1, 1954, and the number of field forage harvesters on farms on November 1, 1954, are from Census of Agriculture reports.

HARVESTING METHODS

Three methods of harvesting considered here are baling, chopping, and handling as long, loose hay. "Chopped hay" as used in this report represents chopped cured hay or chopped hay-crop growth used in dehydrated products such as alfalfa meal. Green, chopped forage, whether stored as grass silage or fed green from the field, is not included. National trends for the different methods are indicated in table 1.

The baling of hay declined in importance--then increased during recent years in response to different causal factors. In 1918, the earliest year covered by published estimates, nearly a fourth of the hay crop was baled and shipped to feed large numbers of nonfarm horses, in addition to the quantity shipped for feeding on farms. Numbers of horses and mules on farms then totaled nearly 27 million head, but in 1954, they had declined to less than 5 million head. In cities and towns, horses disappeared from the power picture even more rapidly and completely than on farms. Meanwhile, the baling of hay declined until in 1939, only 14 percent of the total crop was baled. After that date each periodic indication shows the increasing popularity of baling. In 1944, about 29 percent of all hay was baled; in 1948, about 48 percent; in 1951, about 62 percent; and in 1954, about 73 percent. The apparent reasons for this change in trend since 1939 are (1) the introduction and increased use of automatic tie pickup balers, (2) ease of feeding, and (3) the smaller storage space required.

The once dominant practice of handling and storing hay in long, loose form declined rapidly from 86 percent of the total crop in 1939 to only 20 percent in 1954. Steady declines in the percentage handled as long, loose hay occurred throughout the entire period in most States.

The practice of chopping hay changed little in relative importance between 1951 and 1954 after increasing substantially between 1944 and 1951. According to survey reports, about 2 percent was chopped in 1944, compared with about 7 percent in 1954 - only a slight decrease from that reported in 1951. However, because practices vary somewhat from year to year and the number of farms reporting is small in some areas, this slight decrease probably does not indicate a trend.

In the Lake and Pacific States, more of the hay was chopped in 1954 than elsewhere in the country. In Wisconsin, 26 percent of all the hay was handled in chopped form compared with 20 percent in 1951.

Table 1.-- Hay: Production and percentage distribution, by method of harvest, United States, specified years

Year	: :<
------	---

1/ 1918 Yearbook of Agriculture. Hay: Percentage of crop usually baled. Percentage derived from revised production estimates.

2/ Information not obtained.

BALING METHODS

Changes in methods of baling have helped to increase the popularity of this way of harvesting and handling hay for feeding on the farms where it is grown. Outstanding changes have been (1) development of the automatic baler, and (2) the use of twine for tying.

From small beginnings around 1930, pickup balers made gradual headway, baling 2.5 percent of all hay by 1939 and 13.6 percent by 1944. In 1944, most pickup balers used wire ties and bales were hand-tied. Twine-tie balers gained acceptance rapidly after their introduction around 1941. By 1951, about 38 percent of all hay was twine-tied, and by 1954, the proportion so tied reached more than 50 percent (table 2). The greatest increases in twine baling between 1951 and 1954 were shown in the Lake States and the Southeastern States, with gains from 35 to 53 percent of the crop and from 26 to 46 percent, respectively. As early as 1951, farmers in the Northeastern and Corn Belt States were baling more than 50 percent of their hay with twine. By 1954, the Appalachian, Delta, and Lake States baled well over half of the crop with twine; in the Northeast the proportion so baled had increased to 73 percent and in the Corn Belt to 65 percent.

Use of twine-tied round bales increased moderately from 1951 to 1954 over most of the country. In the Northern Plains, the Corn Belt, and Southeastern States, more than 10 percent of the crop was baled by this method in 1954.

The percentage of the hay crop baled with automatic-tie wire balers increased from 1951 to 1954 in most States; decreases occurred in the percentage baled with hand-tie wire balers. The most important increases in automatic wire baling occurred in the South and West.

SIZE OF FARM AND HARVESTING METHODS

According to survey returns, farms of different sizes use different methods of harvesting hay. Generally, the percentage of hay baled increases with the size of farm whether twine or wire is used (table 3). Notable area exceptions appear, however. In the Pacific States, as farm size increases, a smaller percentage of the hay is baled with twine and a larger percentage with wire. In the Plains States, the larger farms handle more of their hay in long, loose form, including considerable wild hay and other hay commonly stacked. Chopping of hay was relatively more important on large than on small farms in the Northeastern, Corn Belt, and Lake States, but in the Mountain and Pacific States it was more important on small farms.

Table 2.- Hay: Production and percentage distribution, by method of harvest, by States, 1951 and 1954 - Continued

Area and State	1951 1/											
	Percentage -						Percentage -					
	Twine tied			Loose			Twine tied			Loose		
	Produc- tion	Rectan- gular	Round	Auto- matic	Hand	Long	Produc- tion	Rectan- gular	Round	Auto- matic	Hand	Long
	1,000 tons	Percent	Percent	Percent	Percent	Percent	1,000 tons	Percent	Percent	Percent	Percent	Percent
Southeast												
South Carolina.....	371	25	9	5	30	2	257	37	11	7	20	1
Georgia.....	622	16	5	5	55	3	474	35	13	8	23	1
Florida.....	57	10	3	12	57	2	84	27	12	19	30	1
Alabama.....	563	20	6	7	43	2	499	38	7	9	28	1
Total.....	1,513	19.3	6.4	5.8	45.3	2.2	1,314	36.1	10.3	8.9	24.7	1.0
Delta States												
Mississippi.....	774	31	6	9	22	1	618	45	7	21	10	1
Louisiana.....	344	40	8	8	20	2	324	54	8	13	9	1
Arkansas.....	1,294	28	11	12	21	3	643	45	10	13	10	2
Total.....	2,412	30.7	8.9	10.7	21.2	2.0	1,585	46.9	8.4	16.1	9.8	1.4
Southern Plains												
Oklahoma.....	1,796	28	5	26	32	2	1,576	28	7	42	15	3
Texas.....	1,456	24	6	20	36	3	1,445	25	8	42	14	5
Total.....	3,252	26.2	5.4	23.3	33.8	2.5	2,991	26.6	7.5	42.0	14.5	3.9
Mountain												
Montana.....	2,363	22	3	10	5	6	2,863	37	4	14	2	3
Idaho.....	2,281	24	4	9	12	10	2,763	40	5	20	3	11
Wyoming.....	1,255	18	6	12	6	5	1,097	31	8	16	2	3
Colorado.....	2,026	18	2	17	10	11	2,020	30	4	22	3	11
New Mexico.....	418	16	2	35	32	5	513	10	2	68	10	5
Arizona.....	634	8	1	33	44	9	691	7	2	70	11	5
Utah.....	1,023	20	2	19	14	10	1,182	38	4	25	8	9
Nevada.....	594	15	3	22	18	8	490	15	3	42	7	9
Total.....	10,594	19.4	3.2	15.3	12.6	8.3	11,619	32.1	4.4	25.0	4.1	7.4
Pacific												
Washington.....	1,431	26	5	16	17	9	1,545	30	5	30	7	8
Oregon.....	1,551	22	4	20	14	10	1,667	29	4	25	6	11
California.....	5,426	3	1	35	48	8	6,243	9	1	40	36	11
Total.....	8,408	10.5	2.3	28.9	36.4	8.5	9,455	16.0	2.2	35.7	26.0	10.5
United States...	107,991	30.8	7.1	12.2	11.6	7.5	104,987	42.8	8.1	15.9	5.7	7.2

1/ Harvesting Hay and Straw and Use of Balers. U. S. Bur. Agr. Econ., F.M. 107, 30 pp., 1953 (Processed), with State data rounded.

Table 3.- Hay: Production and percentage distribution, by method of harvest, area, and size of farm, 1954

Area and size group	Hay production	Percentage -					
		Baled			Loose		
		Twine tied		Wire tied			
		Rectan- gular	Round	Automatic	Hand tie	Chopped	Long
		1,000 tons	Percent	Percent	Percent	Percent	Percent
Northeast							
Less than 50 acres....	705	62	6	6	1	2	23
50 - 99 do.....	2,000	62	7	5	1	2	23
100-179 do.....	4,100	64	8	6	2	2	18
180-259 do.....	2,700	67	7	6	1	3	16
260-499 do.....	2,800	70	7	7	1	3	12
500-999 do.....	1,000	74	3	6	1	4	12
1000 and over do.....	300	79	5	4	1	5	6
Total do.....	13,605	66.5	6.9	6.0	1.3	2.6	16.7
Corn Belt							
Less than 50 acres....	632	45	6	22	4	4	19
50-99 do.....	2,365	52	8	15	4	6	15
100-179 do.....	6,600	53	11	15	3	7	11
180-259 do.....	4,700	54	12	17	3	7	7
260-499 do.....	4,700	55	13	18	3	8	3
500-999 do.....	1,300	55	14	18	2	8	3
1000 and over do.....	400	55	14	21	1	8	1
Total do.....	20,697	53.5	11.4	16.7	3.0	7.1	8.3
Lake States							
Less than 50 acres :	607	42	7	10	2	11	28
50-99 do.....	2,700	43	6	7	2	11	31
100-179 do.....	6,400	45	8	7	2	14	24
180-259 do.....	3,900	46	6	9	2	17	20
260-499 do.....	3,700	51	7	10	2	19	11
500-999 do.....	850	52	6	12	2	20	8
1000 and over do.....	210	57	7	15	1	17	3
Total do.....	18,367	46.5	6.9	8.5	2.0	15.4	20.7
Northern Plains							
Less than 50 acres :	86	25	21	18	10	6	20
50-99 do.....	200	25	18	20	8	7	22
100-179 do.....	1,025	26	16	18	6	5	29
180-259 do.....	1,125	28	14	18	5	7	28
260-499 do.....	3,850	28	13	16	5	5	33
500-999 do.....	4,500	29	13	12	3	4	39
1000 and over do.....	7,700	29	12	10	2	4	43
Total do.....	18,486	28.5	12.9	12.8	3.4	4.5	37.9
Appalachian							
Less than 50 acres :	850	40	2	8	8	1	41
50-99 do.....	1,600	50	3	7	7	1	32
100-179 do.....	1,825	56	4	8	6	1	25
180-259 do.....	943	58	5	8	5	1	23
260-499 do.....	950	60	9	12	3	1	15
500-999 do.....	470	65	9	10	3	1	12
1000 and over do.....	230	68	12	15	1	1	3
Total do.....	6,868	54.5	4.9	8.7	5.6	1.0	25.3
Southeast							
Less than 50 acres :	174	21	2	7	32	1	37
50-99 do.....	230	30	4	6	29	1	30
100-179 do.....	260	34	8	7	29	1	21
180-259 do.....	110	40	12	6	27	1	14
260-499 do.....	160	42	14	10	22	1	11
500-999 do.....	150	45	17	12	18	1	7
1000 and over do.....	230	44	18	14	15	1	8
Total do.....	1,314	36.1	10.3	8.9	24.7	1.0	19.0

- Continued

Table 3. - Hay: Production and percentage distribution, by method of harvest, area, and size of farm, 1954 - Continued

Area and size group	Hay production : 1,000 tons	Percentage -					
		Baled			Loose		
		Twine tied		Wire tied			
		Rectan- gular	Round	Automatic	Hand tie	Chopped	Long
		Percent	Percent	Percent	Percent	Percent	Percent
Delta States							
Less than 50 acres.....	155	42	4	9	13	2	30
50-99 do.....	250	43	5	11	11	2	28
100-179 do.....	310	45	7	14	10	1	23
180-259 do.....	180	48	8	15	9	2	18
260-499 do.....	230	49	10	20	10	1	10
500-999 do.....	190	51	11	20	11	1	6
1000 and over do.....	270	50	13	22	6	1	8
Total do.....	1,585	46.9	8.4	16.1	9.8	1.4	17.4
Southern Plains							
Less than 50 acres.....	76	10	2	34	29	1	24
50-99 do.....	215	24	4	40	20	1	11
100-179 do.....	525	26	5	41	17	2	9
180-259 do.....	375	26	7	40	14	4	9
260-499 do.....	700	35	8	37	14	4	2
500-999 do.....	500	30	8	39	15	5	3
1000 and over do.....	600	18	11	54	9	6	2
Total do.....	2,991	26.6	7.5	42.0	14.5	3.9	5.5
Mountain							
Less than 50 acres.....	329	31	3	20	9	12	25
50-99 do.....	640	37	4	18	7	12	22
100-179 do.....	1,000	37	3	21	6	12	21
180-259 do.....	700	30	5	26	4	10	25
260-499 do.....	1,300	31	6	22	5	12	24
500-999 do.....	1,300	29	6	30	5	6	24
1000 and over do.....	6,350	32	4	26	3	5	30
Total do.....	11,619	32.1	4.4	25.0	4.1	7.4	27.0
Pacific							
Less than 50 acres.....	855	27	4	26	10	13	20
50-99 do.....	950	24	3	35	13	14	11
100-179 do.....	1,150	19	3	40	14	15	9
180-259 do.....	700	14	2	50	17	9	8
260-499 do.....	1,250	15	2	48	18	10	7
500-999 do.....	1,250	15	3	36	29	10	7
1000 and over do.....	3,300	11	1	29	42	8	9
Total do.....	9,455	16.0	2.2	35.7	26.0	10.5	9.6
United States							
Less than 50 acres.....	4,469	40	5	15	7	6	27
50-99 do.....	11,150	46	6	12	5	7	24
100-179 do.....	23,195	49	8	13	4	8	18
180-259 do.....	15,433	49	8	15	4	9	15
260-499 do.....	19,640	46	10	17	5	8	14
500-999 do.....	11,510	38	9	18	7	6	22
1000 and over do.....	19,590	29	8	20	9	5	29
Total do.....	104,987	42.8	8.1	15.9	5.7	7.2	20.3

SAVING STRAW

Less straw was saved in 1954 than in earlier years, according to estimates based on survey returns. The 18.5 million tons (table 4) is only slightly more than half of the 34 million tons estimated saved in 1945 (table 5). However, it is likely that in recent years farms and ranches have saved only the quantity of straw needed to meet farm needs and market demands. In earlier years when binders and stationary threshers were used more extensively and much of the straw was stacked, almost all of the stacked straw was reported as saved, although much of it was never used.

Methods of handling straw have changed considerably with increased use of combines, pickup balers, and field forage harvesters. Most of the straw saved in 1954 was collected from the field after combining. Thus the chaff, a valuable feeding component, and much of the short straw was not recovered.

Results of the current study indicate that in 1954 two-thirds of the straw saved was baled, compared with about a fourth in 1945. Even though less straw was saved in 1954 than in 1945, 12.4 million tons were baled, whereas in the earlier year only 8.8 million tons were baled (table 6). All areas of the country showed important increases in percentages of straw baled in 1954 over percentages baled in 1945 or 1950.

From 1950 to 1954, the practice of chopping straw increased somewhat, mainly because of the large increase in the Lake States, where some oats are chopped from the windrow with forage harvesters and then threshed with stationary threshers. This method saved all the harvested straw in chopped form.

In 1954, farmers and ranchers in the Great Plains and Mountain States continued their practice of storing a substantial quantity of straw in long, loose form, although the percentage was smaller than in earlier years.

Comparing practices on farms of different sizes, usually a larger portion of the straw was baled on the larger farms (table 7). In areas where saving straw was important, the larger farms also chopped a higher percentage of the straw than farms in smaller size groups.

PICKUP BALERS

During the last 13 years, automatic pickup balers have become increasingly important in accomplishing timely hay harvesting with limited manpower. Estimates for the year 1942 show that no more than 25,000 pickup balers were in use (table 8). The preliminary report of the Census of Agriculture, taken about November 1954, showed 448,000 pickup balers on farms; 5 States each had more than 25,000. Iowa, the

Table 4.- Straw: Quantity saved and percentage distribution, by method of handling, and by States, 1954

Area and State	Straw saved 1,000 tons	Percentage -				
		Baled		Loose		
		Twine tied Percent	Wire tied Percent	Chopped Percent	Long Percent	
Northeast						
New England States:	100	71	5	4	20	
New York.....	800	66	11	12	11	
New Jersey.....	70	75	15	3	7	
Pennsylvania.....	1,165	67	8	7	18	
Delaware.....	40	72	10	3	15	
Maryland.....	225	69	15	1	15	
Total.....	2,400	67.3	9.8	7.8	15.1	
Corn Belt						
Ohio.....	1,150	63	18	9	10	
Indiana.....	650	58	28	7	7	
Illinois.....	1,025	60	27	7	6	
Iowa.....	1,950	62	16	9	13	
Missouri.....	500	59	19	2	20	
Total.....	5,275	61.1	20.3	7.7	10.9	
Lake States						
Michigan.....	825	53	16	14	17	
Wisconsin.....	2,300	28	5	39	28	
Minnesota.....	1,725	58	10	6	26	
Total.....	4,850	42.9	8.7	23.0	25.4	
Northern Plains						
North Dakota.....	625	42	6	3	49	
South Dakota.....	675	42	8	2	48	
Nebraska.....	750	40	21	2	37	
Kansas.....	350	50	29	3	18	
Total.....	2,400	42.5	14.6	2.4	40.5	
Appalachian						
West Virginia.....	125	52	13	2	33	
Kentucky.....	240	62	22	1	15	
Tennessee.....	180	62	16	2	20	
Virginia.....	325	65	10	2	23	
North Carolina.....	180	60	20	3	17	
Total.....	1,050	61.4	15.9	1.9	20.8	
Southeast						
South Carolina.....	65	49	20	2	29	
Georgia.....	42	50	25	2	23	
Florida.....	3	43	30	2	25	
Alabama.....	40	40	30	2	28	
Total.....	150	46.7	24.3	2.0	27.0	
Delta States						
Mississippi.....	50	54	28	2	16	
Louisiana.....	40	59	19	2	20	
Arkansas.....	80	50	18	2	30	
Total.....	170	53.3	21.2	2.0	23.5	
Southern Plains						
Oklahoma.....	130	29	34	4	33	
Texas.....	120	34	20	4	42	
Total.....	250	31.4	27.3	4.0	37.3	
Mountain						
Montana.....	400	26	11	3	60	
Idaho.....	350	43	18	9	30	
Wyoming.....	85	30	13	2	55	
Colorado.....	200	23	21	9	47	
New Mexico.....	35	20	40	5	35	
Arizona.....	50	10	74	6	10	
Utah.....	135	33	25	7	35	
Nevada.....	20	13	42	5	40	
Total.....	1,275	30.2	19.9	6.1	43.8	
Pacific						
Washington.....	150	32	31	5	32	
Oregon.....	170	35	35	5	25	
California.....	360	9	82	3	6	
Total.....	680	20.6	59.0	3.9	16.5	
United States:	18,500	50.5	16.5	10.3	22.7	

Table 5.- Straw: Quantity saved and percentage distribution, by method of handling and by States, 1945 and 1950 1/

Area and State	1945		1950					
	Straw saved	Percentage baled	Straw saved	Percentage -				Long
				Baled	Wire	Chopped	Loose	
	1,000 tons	Percent	1,000 tons	Percent	Percent	Percent	Percent	
Northeast								
New England States:	77	5	63	35	10	3		52
New York.....	653	31	594	41	19	15		25
New Jersey.....	55	87	58	64	25	3		8
Pennsylvania.....	1,330	30	992	47	15	8		30
Delaware.....	54	35	37	58	17	3		22
Maryland.....	325	29	211	40	25	1		34
Total.....	2,494	30.8	1,955	44.8	17.5	8.7		29.0
Corn Belt								
Ohio.....	1,805	55	1,170	44	29	8		19
Indiana.....	1,212	62	786	52	30	7		11
Illinois.....	1,902	64	1,179	41	39	7		13
Iowa.....	3,131	42	2,470	33	26	6		35
Missouri.....	817	42	483	26	25	3		46
Total.....	8,867	52.1	6,088	38.6	29.6	6.5		25.3
Lake States								
Michigan.....	1,468	39	914	33	22	8		37
Wisconsin.....	2,945	11	2,075	17	8	23		52
Minnesota.....	5,165	15	2,476	37	14	5		44
Total.....	9,578	17.4	5,465	28.6	13.3	12.2		45.9
Northern Plains								
North Dakota.....	2,119	5	1,409	20	9	10		61
South Dakota.....	2,648	6	966	22	7	3		68
Nebraska.....	1,765	11	717	13	16	2		69
Kansas.....	438	29	198	26	26	5		43
Total.....	6,970	8.5	3,290	19.4	11.0	5.9		63.7
Appalachian								
West Virginia.....	124	16	79	20	19	4		57
Kentucky.....	197	48	149	35	24	1		40
Tennessee.....	225	36	138	35	20	1		44
Virginia.....	407	31	248	21	22	3		54
North Carolina.....	255	46	140	28	36	1		35
Total.....	1,208	36.6	754	27.5	24.4	1.9		46.2
Southeast								
South Carolina.....	280	19	119	16	21	3		60
Georgia.....	232	14	72	14	16	1		69
Florida.....	8	25	4	5	20	2		73
Alabama.....	80	16	38	15	20	3		62
Total.....	600	16.6	233	15.0	19.6	2.3		63.1
Delta States								
Mississippi.....	85	31	35	30	30	---		40
Louisiana.....	23	19	17	20	25	---		55
Arkansas.....	107	18	35	9	12	3		76
Total.....	215	23.0	87	19.6	21.9	1.2		57.3
Southern Plains								
Oklahoma.....	403	14	72	14	28	2		56
Texas.....	278	25	93	10	17	2		71
Total.....	681	18.7	165	11.7	21.9	1.8		64.6
Mountain								
Montana.....	507	2	475	21	11	3		65
Idaho.....	620	10	198	23	16	4		57
Wyoming.....	161	3	84	21	10	1		68
Colorado.....	868	9	221	9	13	6		72
New Mexico.....	32	6	21	22	43	3		32
Arizona.....	13	23	28	10	80	1		9
Utah.....	283	16	117	23	24	3		50
Nevada.....	6	25	10	26	31	5		38
Total.....	2,492	8.2	1,154	18.9	15.7	3.8		61.6
Pacific								
Washington.....	363	19	179	19	25	9		47
Oregon.....	185	27	134	19	31	6		44
California.....	117	75	152	4	78	6		12
Total.....	665	30.9	465	14.3	44.2	7.1		34.4
United States:	33,770	26.0	19,656	30.5	19.8	7.8		41.9

1/ Includes wheat, oats, barley, rye, and flaxseed straw. Data from BAE Report F.M. 91, "Harvesting Small Grains and Soybeans and Methods of Saving Straw." The data for individual States were rounded.

Table 6.- Straw: Quantity baled and percentage distribution, by method of baling, and by States, specified years

Area and State	1950 1/				1951 2/			1954 2/		
	Percentage				Percentage			Percentage		
	baled				baled			baled		
	Baled	Twine	Wire		Baled	Twine	Wire	Baled	Twine	Wire
	1,000	1,000	Per-	Per-	1,000	Per-	Per-	1,000	Per-	Per-
	tons	tons	cent	cent	tons	cent	cent	tons	cent	cent
Northeast										
New England States..	4	28	78	22	40	93	7	76	93	7
New York.....	200	358	68	32	610	75	25	616	86	14
New Jersey.....	48	51	72	28	60	90	10	63	83	17
Pennsylvania.....	402	615	76	24	665	80	20	874	89	11
Delaware.....	19	28	78	22	20	85	15	33	87	13
Maryland.....	95	137	62	38	110	73	27	189	82	18
Total.....	768	1,217	72.0	28.0	1,535	78.2	21.8	1,851	87.2	12.8
Corn Belt										
Ohio.....	993	852	60	40	810	73	27	932	78	22
Indiana.....	749	645	63	37	590	63	37	559	68	32
Illinois.....	1,225	945	51	49	1,000	63	37	892	69	31
Iowa.....	1,315	1,462	56	44	1,200	61	39	1,521	79	21
Missouri.....	341	247	52	48	225	56	44	390	76	24
Total.....	4,623	4,151	56.5	43.5	3,825	64.1	35.9	4,294	75.0	25.0
Lake States										
Michigan.....	571	503	61	39	540	73	27	569	77	23
Wisconsin.....	315	524	67	33	690	76	24	759	85	15
Minnesota.....	785	1,261	72	28	1,440	78	22	1,173	85	15
Total.....	1,671	2,288	68.4	31.6	2,670	76.5	23.5	2,501	83.2	16.8
Northern Plains										
North Dakota.....	102	414	68	32	315	81	19	300	88	12
South Dakota.....	164	277	76	24	345	86	14	338	84	16
Nebraska.....	198	206	46	54	380	60	40	458	65	35
Kansas.....	125	103	50	50	90	52	48	276	63	37
Total.....	589	1,000	63.8	36.2	1,130	73.2	26.8	1,372	74.3	25.7
Appalachian										
West Virginia.....	20	31	52	48	40	58	42	81	80	20
Kentucky.....	95	88	59	41	125	64	36	202	74	26
Tennessee.....	81	75	64	36	105	76	24	140	79	21
Virginia.....	127	107	50	50	170	70	30	244	87	13
North Carolina.....	118	89	43	57	95	51	49	144	75	25
Total.....	441	390	53.3	46.7	535	65.5	34.5	811	79.6	20.4
Southeast										
South Carolina.....	53	44	43	57	45	77	23	45	71	29
Georgia.....	32	22	46	54	28	52	48	31	67	33
Florida.....	2	1	20	80	2	32	68	2	59	41
Alabama.....	13	13	42	58	20	55	45	28	57	43
Total.....	100	80	43.4	56.6	95	64.1	35.9	106	65.9	34.1
Delta States										
Mississippi.....	26	21	50	50	35	80	20	41	66	34
Louisiana.....	4	8	44	56	25	80	20	31	76	24
Arkansas.....	19	7	42	58	20	78	22	54	74	26
Total.....	49	36	47.1	52.9	80	79.5	20.5	126	71.9	28.1
Southern Plains										
Oklahoma.....	57	30	33	67	40	43	57	82	46	54
Texas.....	70	25	37	63	70	53	47	65	63	37
Total.....	127	55	34.8	65.2	110	49.4	50.6	147	53.5	46.5
Mountain										
Montana.....	12	149	67	33	125	80	20	148	70	30
Idaho.....	62	76	60	40	140	65	35	214	70	30
Wyoming.....	5	26	67	33	35	82	18	37	69	31
Colorado.....	75	48	39	61	80	53	47	88	52	48
New Mexico.....	2	13	34	66	15	20	80	21	33	67
Arizona.....	3	25	24	76	20	20	80	42	12	88
Utah.....	44	55	49	51	65	32	68	78	57	43
Nevada.....	2	6	45	55	5	40	60	11	24	76
Total.....	205	398	55.7	44.3	485	60.2	39.8	639	60.1	39.9
Pacific										
Washington.....	68	79	44	56	115	38	62	94	51	49
Oregon.....	50	67	38	62	120	53	47	119	50	50
California.....	88	126	5	95	265	2	98	328	10	90
Total.....	206	272	24.5	75.5	500	22.5	77.5	541	25.9	74.1
United States...	8,779	9,887	60.6	39.4	10,965	68.0	32.0	12,388	75.4	24.6

1/ Includes wheat, oats, barley, rye, and flaxseed straw.

2/ Includes all kinds of straw.

Table 7.- Straw: Quantity saved and percentage distribution, by method of handling, area, and size of farm, 1954

Area and size group	Straw saved	Percentage -			
		Baled		Loose	
		Twine tied	Wire tied	Chopped	Long
	<u>1,000 tons</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
Northeast					
Less than 50 acres....	110	65	6	5	24
50-99 do.....	450	65	9	6	20
100-179 do.....	825	67	8	8	17
180-259 do.....	450	68	12	9	11
260-499 do.....	375	70	12	8	10
500-999 do.....	150	68	12	10	10
1000 and over do.....	40	72	12	9	7
Total do.....	2,400	67.3	9.8	7.8	15.1
Corn Belt					
Less than 50 acres....	140	45	30	3	22
50-99 do.....	600	60	18	5	17
100-179 do.....	1,800	61	20	7	12
180-259 do.....	1,050	62	20	9	9
260-499 do.....	1,250	62	21	9	8
500-999 do.....	300	63	20	9	8
1000 and over do.....	135	65	20	9	6
Total do.....	5,275	61.1	20.3	7.7	10.9
Lake States					
Less than 50 acres....	150	32	8	25	35
50-99 do.....	700	36	7	22	35
100-179 do.....	1,750	37	8	23	32
180-259 do.....	1,000	47	9	23	21
260-499 do.....	950	52	10	23	15
500-999 do.....	240	55	12	24	9
1000 and over do.....	60	59	12	24	4
Total do.....	4,850	42.9	8.7	23.0	25.4
Northern Plains					
Less than 50 acres....	20	28	16	1	55
50-99 do.....	70	29	17	2	52
100-179 do.....	300	32	22	1	45
180-259 do.....	250	44	15	3	38
260-499 do.....	700	45	15	2	38
500-999 do.....	550	46	13	3	38
1000 and over do.....	510	43	11	3	43
Total do.....	2,400	42.5	14.6	2.4	40.5
Appalachian					
Less than 50 acres....	100	45	20	1	34
50-99 do.....	225	57	17	1	25
100-179 do.....	275	58	17	2	23
180-259 do.....	150	66	15	2	17
260-499 do.....	175	70	14	2	14
500-999 do.....	75	70	13	4	13
1000 and over do.....	50	75	11	4	10
Total do.....	1,050	61.4	15.9	1.9	20.8

- Continued

Table 7.- Straw: Quantity saved and percentage distribution, by method of handling, area, and size of farm, 1954 - Continued

Area and size group	Straw saved	Percentage -			
		Baled		Loose	
		Twine tied	Wire tied	Chopped	Long
	1,000 tons	Percent	Percent	Percent	Percent
Southeast					
Less than 50 acres....	30	21	23	4	52
50-99 do.....	15	35	25	4	36
100-179 do.....	25	48	24	3	25
180-259 do.....	10	55	26	2	17
260-499 do.....	25	56	28	1	15
500-999 do.....	15	60	28	---	12
1000 and over do.....	30	60	20	---	20
Total do.....	150	46.7	24.3	2.0	27.0
Delta States					
Less than 50 acres....	15	34	9	5	52
50-99 do.....	25	45	16	4	35
100-179 do.....	15	48	15	4	33
180-259 do.....	25	49	25	3	23
260-499 do.....	30	50	34	1	15
500-999 do.....	15	64	20	---	16
1000 and over do.....	45	67	20	---	13
Total do.....	170	53.3	21.2	2.0	23.5
Southern Plains					
Less than 50 acres....	20	55	10	---	35
50-99 do.....	25	49	16	---	35
100-179 do.....	25	45	18	1	36
180-259 do.....	20	35	28	3	34
260-499 do.....	60	25	30	4	41
500-999 do.....	40	25	30	8	37
1000 and over do.....	60	20	37	6	37
Total do.....	250	31.4	27.3	4.0	37.3
Mountain					
Less than 50 acres....	40	34	25	12	29
50-99 do.....	100	35	16	13	36
100-179 do.....	190	35	15	14	36
180-259 do.....	80	35	15	10	40
260-499 do.....	170	34	17	5	44
500-999 do.....	150	28	22	4	46
1000 and over do.....	545	26	23	2	49
Total do.....	1,275	30.2	19.9	6.1	43.8
Pacific					
Less than 50 acres....	40	33	30	7	30
50-99 do.....	75	29	41	8	22
100-179 do.....	100	24	51	4	21
180-259 do.....	60	20	56	4	20
260-499 do.....	75	20	61	3	16
500-999 do.....	80	21	63	2	14
1000 and over do.....	250	15	71	3	11
Total do.....	680	20.6	59.0	3.9	16.5
United States					
Less than 50 acres	665	42	18	9	31
50-99 do.....	2,285	50	13	10	27
100-179 do.....	5,305	50	15	12	23
180-259 do.....	3,095	55	15	13	17
260-499 do.....	3,810	55	17	10	18
500-999 do.....	1,615	51	18	8	23
1000 and over do.....	1,725	38	25	4	33
Total do.....	18,500	50.5	16.5	10.3	22.7

Table 8.- Windrow pickup balers on farms, by States, specified years, and distribution by type, 1951 and 1955

Area and State	1951		1954		1955	
	Estimate	Census	Jan. 1, 1951	Percentage- 1/	Jan. 1, 1954	Percentage- 1/
	Jan. 1, 1942	April 1, 1950	esti- mated	Twine : Wire	esti- mated	Twine : Wire
	Number	Number	Number	Percent	Percent	Percent
Census 1955 (Nov. 1954)						
Number						
Northeast						
Maine.....	20	524	750		1,500	94
New Hampshire....	10	292	400		825	94
Vermont.....	30	837	1,175		2,300	94
Massachusetts....	10	700	900		1,550	94
Rhode Island.....	0	74	100		150	94
Connecticut.....	10	688	850		1,350	94
New York.....	350	9,221	11,900		21,400	86
New Jersey.....	340	1,799	2,000		2,700	82
Pennsylvania.....	430	9,241	11,800		21,300	87
Delaware.....	50	405	450		625	80
Maryland.....	250	2,194	2,675		4,300	77
Total.....	1,500	25,975	33,000	79	58,000	87
Corn Belt						
Ohio.....	1,400	12,438	15,500		26,000	81
Indiana.....	1,300	9,679	11,500		17,000	81
Illinois.....	2,300	15,762	18,000		27,000	79
Iowa.....	2,100	13,192	16,000		33,000	74
Missouri.....	1,400	9,047	11,000		18,000	79
Total.....	8,500	60,118	74,000	65	121,000	78
Lake States						
Michigan.....	900	7,480	9,500		16,500	74
Wisconsin.....	1,000	8,339	11,500		22,500	86
Minnesota.....	600	7,817	11,000		22,000	75
Total.....	2,500	23,636	32,000	64	61,000	79
Northern Plains						
North Dakota....	200	2,404	3,500		7,500	90
South Dakota....	100	3,000	4,000		8,500	83
Nebraska.....	300	4,274	5,500		11,000	75
Kansas.....	700	8,160	10,000		16,000	62
Total.....	1,300	17,838	23,000	56	43,000	74
Appalachian						
West Virginia....	100	618	1,000		2,000	83
Kentucky.....	700	5,979	7,000		10,000	78
Tennessee.....	370	4,795	5,500		7,300	82
Virginia.....	250	3,557	4,500		8,000	84
North Carolina..	400	5,797	6,000		6,700	60
Total.....	1,820	20,746	24,000	52	34,000	77
Southeast						
South Carolina..	125	2,205	2,300		2,800	86
Georgia.....	250	3,802	3,800		3,800	74
Florida.....	25	310	350		500	72
Alabama.....	300	2,446	2,550		2,900	62
Total.....	700	8,763	9,000	43	10,000	74
Delta States						
Mississippi.....	400	3,294	3,400		4,500	71
Louisiana.....	200	1,956	2,100		3,000	78
Arkansas.....	400	3,317	3,500		4,500	60
Total.....	1,000	8,567	9,000	50	12,000	69
Southern Plains						
Oklahoma.....	1,400	5,207	6,000		8,500	42
Texas.....	2,600	6,051	7,000		9,500	58
Total.....	4,000	11,258	13,000	36	18,000	50
Mountain						
Montana.....	170	1,719	2,400		4,750	77
Idaho.....	200	2,253	3,000		5,700	67
Wyoming.....	80	668	875		1,600	65
Colorado.....	140	1,667	2,150		3,800	62
New Mexico.....	270	976	1,100		1,600	50
Arizona.....	400	623	650		700	28
Utah.....	50	1,449	1,800		3,100	39
Nevada.....	105	471	525		750	20
Total.....	1,415	9,826	12,500	40	22,000	60
Pacific						
Washington.....	250	1,950	2,400		4,300	62
Oregon.....	350	2,217	2,500		4,000	56
California.....	1,800	5,153	5,600		7,700	13
Total.....	2,400	9,320	10,500	25	16,000	37
United States:	25,135	196,047	240,000	59	395,000	75

1/ Based largely on material supplied by crop reporters of the United States Department of Agriculture.

leading State, had 38,000, or an average of 1 for every 5 farms. The Corn Belt, Lake, and Northeastern States together had nearly two-thirds of the Nation's pickup balers in 1954.

In 1951, about 59 percent of the pickup balers were of the twine-tie type; by 1954, twine was used by 75 percent of the pickup balers. In 1954, only the Pacific States had more wire-tie than twine-tie balers.

OTHER EQUIPMENT

The number of mowers on farms declined from about 2.9 million in 1942 to 2.5 million in 1954 (table 9). In 1942, however, most of the mowers reported were the horse-drawn type, some of which were used with tractors, but in 1954, 56 percent were tractor-powered.

Between 1942 and 1954, the number of side-delivery rakes increased from 716,000 to 1,175,000. Increased use of pickup balers and forage harvesters contributed to wider and more extensive use of side-delivery rakes. In the Appalachian and Southern States as a whole, the increase in the number of these rakes amounted to about 450 percent.

The number of field forage harvesters on farms increased by 150 percent from 1950 to 1955. Sales of this machine began to be important after 1945 and they are still at a high level. Forage harvesters are used extensively for chopping silage, green feed, and straw, as well as for chopping hay.

Table 9.- Field forage harvesters, side-delivery rakes, and mowers on farms, by States, specified years

Area and State	Field forage harvesters		Side-delivery rakes		Estimated Mowers			
	Estimate: Jan. 1, 1950	Census (Nov. 1, 1954)	Jan. 1, 1942	Jan. 1, 1954	Jan. 1, 1942	Jan. 1, 1954		
						Quantity:	Percentage distribution	
							Power driven	Ground driven
							Percent	Percent
	Number	Number	Number	Number	Number	Number	Percent	Percent
Northeast								
New England States..	1,500	4,748	17,900	30,000	95,100	45,500	67	33
New York.....	5,000	11,769	46,000	54,000	117,000	79,000	57	43
New Jersey.....	600	1,701	5,500	7,000	16,000	12,000	50	50
Pennsylvania.....	3,500	7,796	42,000	59,000	122,000	90,000	56	44
Delaware.....	100	282	1,200	2,000	5,200	3,500	43	57
Maryland.....	900	1,700	5,700	11,000	26,500	20,000	60	40
Total.....	11,600	27,996	118,300	163,000	381,800	250,000	58	42
Corn Belt								
Ohio.....	3,500	7,452	76,000	78,000	156,000	110,000	55	45
Indiana.....	2,200	5,566	36,000	62,000	119,000	95,000	58	42
Illinois.....	5,800	12,263	74,000	76,000	170,000	135,000	68	32
Iowa.....	6,500	13,956	100,000	110,000	180,000	154,000	65	35
Missouri.....	2,000	7,635	13,000	39,000	127,000	133,000	53	47
Total.....	20,000	46,872	299,000	365,000	752,000	627,000	60	40
Lake States								
Michigan.....	3,500	8,743	62,000	78,000	123,000	97,000	41	59
Wisconsin.....	13,000	26,831	83,000	103,000	141,000	143,000	56	44
Minnesota.....	7,500	15,556	56,000	93,000	155,000	118,000	56	44
Total.....	24,000	51,130	201,000	274,000	419,000	388,000	52	48
Northern Plains								
North Dakota.....	2,000	7,305	5,000	19,000	66,000	61,000	59	41
South Dakota.....	2,000	5,996	5,000	21,000	58,000	63,000	60	40
Nebraska.....	3,000	7,807	12,000	33,000	118,000	89,000	61	39
Kansas.....	5,000	13,084	13,000	35,000	98,000	87,000	66	34
Total.....	12,000	34,192	35,000	108,000	340,000	300,000	62	38
Appalachian								
West Virginia.....	200	704	1,000	6,000	41,200	34,000	35	65
Kentucky.....	600	1,937	4,000	21,000	63,500	33,000	49	51
Tennessee.....	500	2,060	1,680	20,000	80,075	79,000	52	48
Virginia.....	700	2,197	3,600	19,000	55,000	55,000	42	58
North Carolina.....	200	1,847	1,000	9,000	46,900	54,000	43	57
Total.....	2,200	8,745	11,280	75,000	286,675	305,000	46	54
Southeast								
South Carolina.....	200	728	200	6,000	35,750	35,000	29	71
Georgia.....	300	1,093	1,000	10,000	37,000	42,000	48	52
Florida.....	50	425	500	2,000	11,000	10,000	70	30
Alabama.....	100	803	1,000	5,000	31,500	36,000	44	56
Total.....	650	3,049	2,700	23,000	115,250	123,000	43	57
Delta States								
Mississippi.....	100	1,487	1,000	3,000	49,500	52,000	33	67
Louisiana.....	100	628	2,000	5,000	22,000	25,000	40	60
Arkansas.....	400	1,273	1,000	9,000	64,000	51,000	41	59
Total.....	600	3,388	4,000	17,000	135,500	128,000	38	62
Southern Plains								
Oklahoma.....	800	3,051	4,000	18,000	60,000	55,000	64	36
Texas.....	900	5,064	5,000	17,000	100,000	74,000	59	41
Total.....	1,700	8,115	9,000	35,000	160,000	129,000	61	39
Mountain								
Montana.....	1,000	1,413	2,125	10,000	35,650	31,000	65	35
Idaho.....	1,000	2,214	5,000	18,000	36,000	34,000	71	29
Wyoming.....	300	702	1,000	5,000	18,000	13,000	69	31
Colorado.....	2,100	3,823	8,000	20,000	42,000	34,000	65	35
New Mexico.....	200	467	2,000	7,000	10,200	9,000	78	22
Arizona.....	250	792	1,800	3,000	8,000	5,000	80	20
Utah.....	400	1,585	2,000	9,000	14,800	14,000	71	29
Nevada.....	200	242	850	2,000	3,930	3,000	67	33
Total.....	5,450	11,238	22,775	74,000	168,580	143,000	69	31
Pacific								
Washington.....	800	2,037	2,500	14,000	31,500	38,000	63	37
Oregon.....	800	1,689	2,000	10,000	35,000	31,000	65	35
California.....	1,200	3,405	8,000	17,000	59,500	38,000	74	26
Total.....	2,800	7,131	12,500	41,000	126,000	107,000	67	33
United States..	81,000	201,856	715,555	1,175,000	2,884,805	2,500,000	56	44

